



Unmanned Aerial Vehicle Vertical Applications' Trials Leveraging Advanced 5G Facilities

ISSUE HIGHLIGHTS

The ninth issue of the 5G!Drones newsletter presents the project activities during the period June - August 2021. This issue focuses on the latest 5G!Drones dissemination and communication activities, the trials performed, the deliverables that have been published, the latest GA meeting, as well as the 5G!Drones presence in the EuCNC 2021.

5G!Drones activities in numbers:

- One Journal Paper
- Four White Paper
- Two Articles
- Two Presentations
- 1 Showcasing Event
- Four Pre-Trials/Trials
- Five 5G-PPP Activities
- Three Submitted Deliverables
- 7th 5G!Drones General Assembly (1-2 June 2021)
- EuCNC 2021 presence and 5G!Drones Virtual Booth

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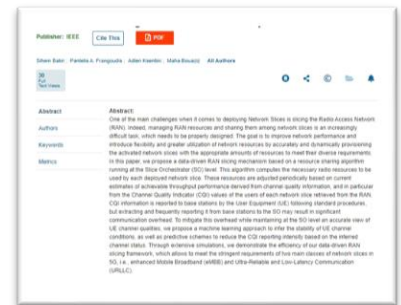
DISSEMINATION AND COMMUNICATION ACTIVITIES

JOURNAL PAPER

5G!Drones partners, Sihem Bakri, Pantelis A. Frangoudis, Adlen Ksentini and Maha Bouaziz, published the journal paper entitled: "Data-Driven RAN Slicing Mechanisms for 5G and Beyond", on IEEE Transactions on Network and Service Management journal, 1-15 pages, Online ISSN: 1932-4537, DOI 10.1109/TNSM.2021.3098193.

You may find the paper online here:

<https://ieeexplore.ieee.org/document/9490293>



WHITE PAPERS

EUROPEAN VISION FOR THE 6G NETWORK ECOSYSTEM

The 5G-PPP White paper entitled "European Vision for the 6G Network Ecosystem", was released in June 2021 showcasing that 6G will be one of the basic foundations of human societies of the future. It also includes contributions by 5G!Drones. You may access and read the white paper here:

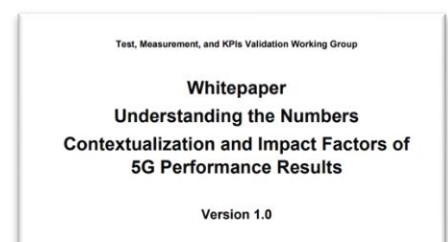
<https://5g-ppp.eu/wp-content/uploads/2021/06/WhitePaper-6G-Europe.pdf?fbclid=IwAR3HuK-XzLBtvKmlI6L6z155yvtg8Y00InCUBC2kcGNflsNnwYhFWfSy-k>



"UNDERSTANDING THE NUMBERS – CONTEXTUALIZATION AND IMPACT FACTORS OF 5G PERFORMANCE RESULTS"

Ilkka Kansala and Gokul Srinivasan, 5G!Drones partners, contributed to the 5GPPP white paper entitled: "Understanding the Numbers - Contextualization and Impact Factors of 5G Performance Results". You may access the white paper here:

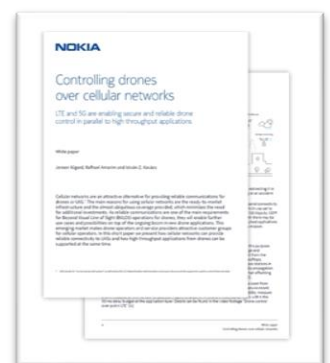
https://5g-ppp.eu/wp-content/uploads/2021/08/TMV-Results-Explanation-White-Paper-V1.0.pdf?fbclid=IwAR0aTpQ1wpTKH_acRmKCV-hrELHSTWvULzS-8PBZOY_sNTdG0DWUw-e0RXk



CONTROLLING DRONES OVER CELLULAR NETWORKS

A White paper entitled "Controlling drones over cellular networks" has been released by Nokia (5G!Drones partner), referencing 5G!Drones "D1.1 - Use case specifications and requirements", June 2021. You may learn more here:

<https://www.bell-labs.com/institute/white-papers/controlling-drones-over-cellular-networks/>

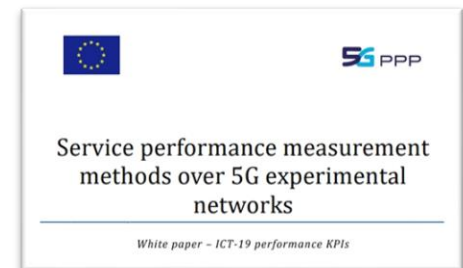




SERVICE PERFORMANCE MEASUREMENT METHODS OVER 5G EXPERIMENTAL NETWORKS

Gokul Srinivasan (robots.expert) 5G!Drones partner participated and contributed to the 5GPPP white paper entitled : “Service performance measurement methods over 5G experimental networks”. You may find the white paper by clicking in the following link:

https://5g-ppp.eu/wp-content/uploads/2021/06/Service-performance-measurement-methods-over-5G-experimental-networks_short_version_08052021-Final.pdf



ARTICLES

ARTICLE-INTERVIEW IN STARTUPPER MAGAZINE (IN GREEK)

A very interesting article (in Greek) was released in News 24/7 website by 5G!Drones partners, Harilaos Koumaras and George Makropoulos (NSRF "Demokritos"), explaining the drones of the future. They also shared details about 5G!Drones project. You may access the article here:

<https://www.news247.gr/technologia/pos-tha-einai-ta-drones-toy-mellontos.9272133.html>



ESPOO INTERNATIONAL SCHOOL FIRST GRADERS VISIT TO AALTO

A very interesting article has been published describing how Aalto University, 5G!Drones partner, has performed a small showcasing event on 27th May 2021. The showcasing was for the benefit of first graders students from the international school of Espoo, Finland. AU presented its current work related to cellular drones and virtual reality (VR) as part of 5G!Drones activities and also presented a demo of streaming a 360 video from flying drones. You may learn more here:

<http://mosaic-lab.org/events.aspx?id=c4c30c79-7b70-42c7-9097-bf1711879d2c>





PRESENTATIONS

PRACTICAL INSIGHTS FROM 5G TEST, MEASUREMENT AND KPI VALIDATION WITH VERTICAL APPLICATIONS

5G!Drones Partner, Ilkka Kansala (Nokia) Ole Grøndalen, (Telenor) participated and presented in 5G-PPP TMV event: “Practical insights from 5G Test, Measurement and KPI Validation with vertical applications”, on June 18. The presentation title is: "Coverage aspects in 5G experimentation results", You may learn more here: <https://5g-ppp.eu/event/practical-insights-from-5g-test-measurement-and-kpi-validation-with-vertical-applications>



SHOWCASING EVENT

Aalto University, 5G!Drones partner, has performed a small showcasing event on May 27 2021. The showcasing was for the benefit of first graders students from the international school of Espoo, Finland. AU presented its current work related to cellular drones and virtual reality (VR) as part of 5G!Drones activities and also presented a demo of streaming a 360 video from flying drones. More information available here: <http://mosaic-lab.org/events.aspx?id=c4c30c79-7b70-42c7-9097-bf1711879d2c>





TRIALS

ATHENS REMOTE PRE-TRIALS

5G!Drones partners NCSR DEMOKRITOS, COSMOTE and Unmanned Systems performed remote-emulated tests on 5GENESIS Athens 5G experimental platform at NCSR campus on 23 April 2021. Focus paid on measurements, connectivity, KPIs and Athens UC4 details.



EURECOM REMOTE TESTS AND PRETRIALS

5G!Drones partners, EURECOM, Cafatech, INVOLI, Droneradar, Unmanned Systems and AIRBUS performed remote tests and pretrials on 17 June 2021, at EURECOM premises for testing 5G!Drones Integration Release1 components and UC1Sc1 and UC2Sc1, UC2SC2 scenarios and collecting feedback for physical tests in September - October 2021.



5G!DRONES ATHENS TRIALS ON 5GENESIS ATHENS PLATFORM

5G!Drones partners, NCSR DEMOKRITOS, COSMOTE and INFOLYSiS performed joint trials of 5GENESIS and 5G!Drones projects! 5G!Drones Use Case 4 (Connectivity during crowded events) was tested on the 5GENESIS Athens 5G experimentation platform at COSMOTE Academy premises in Athens in June 29-30 June, 2021.



5G!DRONES AALTO UNIVERSITY PRE-TRIALS

Pretrials were executed at Aalto University on 19-20 August 2021 as part of 5G!Drones project. Involved 5G!Drones partners (AU, CAF, DRR, INV, FRQ, RXB) validated use cases with 5G flights including scenarios where the remote pilot (not the PIC) takes over the control and pilots the aircraft with a tethered joystick. The team also validated C2 link over 5G, and UTM over 5G. 5G!Drones.





5G-PPP ACTIVITIES

NEWSFLASH ISSUES

The latest newsflash issues of the 5g-ppp are available here:

- Newsflash Issue 60 (May 2021):
<https://5g-ppp.eu/newsflash-may-2021/>
- Newsflash Issue 61 (June 2021):
<https://5g-ppp.eu/newsflash-june-2021/>
- Newsflash Issue 62 (July 2021):
<https://5g-ppp.eu/newsflash-july-2021/>

PHASE 3 PROJECTS BROCHURE

- 5G PPP, Phase 3 Projects Brochure, June 2021:
https://5g-ppp.eu/wp-content/uploads/2021/06/5GPPP_Phase3_Brochure_v7.2-web.pdf





5G-PPP ANNUAL JOURNAL OF 2021

The European 5G-PPP Annual Journal of 2021 is now available! You may access it and find 5G!Drones project (pp 48-50) among other H2020 research projects here:

<https://5g-ppp.eu/the-5g-european-annual-journal-2021-is-out/>



5G!Drones

Goals

The main goal of the 5G!Drones project is to enable safe and secure BVLOS flights using 5G mobile networks. The project will produce solutions in order to enable better business models for the use of 5G network in UAV operations. 5G networks leverages the mission planning, automation of flight operations, and post-flight data analysis, all of which is within the scope of the use cases and scenarios being carried out in the project. Alongside the use cases, the project will also aim to deliver viable and sustainable business models for the use of 5G networks in the context of UAVs.

Major achievements and milestones of year 2020

A crucial milestone for the project advancement was that the initially outlined VTOL UAS missions were precisely defined and planned.

In addition to this, Key Performance Indicators KPI's on the project activities, with regards to both the VTOL UAVs and 5G operations were set.

The 5G use cases were defined, which set a stable foundation for the particular regional and transdisciplinary project activities on the use cases.



Demonstration sites, scenarios and operations were planned and performed at all 5 geographic and organisational project centres.

Additionally, two major workshops were organised.

Workshops

Aerial Communications in 5G and Beyond Networks (AERCOMM) workshop, co-organised by 5G!Drones and EU-Korea PIMO-5G project, co-located with IEEE Wireless Communications and Networking Conference on 25th–28th of May 2020 (Virtual Conference), Beyond Connectivity: What Comes After 5G was performed.

"5G Experimentation Facilities and Vertical Trials: Current Status and Future Perspectives" online workshop on 14 Oct 2020 was organised by the Institute of Informatics & Telecommunications of NCSR Demokritos (Athens, Greece), EU projects 5GENESIS and 5G!Drones and with the support of the 5G PPP partnership.

Trials and demonstrations

Orange France, 5G!Drones partner, conducted an experiment of a tethered drone embedding a cellular base station based on Open Air Interface, acting as a connectivity bubble, at French championships of Windsurf in Saint-Pierre-Quiberon France, from 1st to 3rd of November, as part of 5G!Drones use case #4 (UC4) initial tests.

In May 2020, NCSR team, 5G!Drones partner, performed the first feasibility flight of a drone piloting over 5G, i.e. transmitting the C2 (Communication and Control) channel over 5G. The feasibility flight was performed using the 5GENESIS Athens 5G experimentation platform located at NCSR Demokritos campus as initial trial of the 5G!Drones Athens use case.

On June 30, 2020 5G!Drones partners NCSR, CAFA Tech and Unmanned Life conducted remote feasibility tests related to 5G!Drones Use Case 4 "Drone based 5G connectivity extension" scenario.

5G!Drones partners conducted flight trials under 5G network in Aalto and Oulu, Finland, on August 24–28 2020 for collecting preliminary inputs for 5G!Drones next developments and actions. In these tests, 5G infrastructure owners of Aalto University and Oulun yliopisto – University of Oulu, and technology companies CAFA Tech, HEPTA, NOKIA and robots.expert participated, conducting physically tests of 5G!Drones use cases UC1 and UC3.

Nokia, 5G!Drones partner, executed 5G!Drones pre-trial measurements during 27–28 August 2020, which focused on the Nokia lead Use Case 3 Scenario 3: Location of UE in non-GPS environments. These feasibility tests were successfully conducted in Nokia premises in Oulu, Finland.

5G!Drones partners NCSR Demokritos, Cosmote, HEPTA, CAFA Tech, robots.expert, Municipality of Egaleo and INFOLYSIS, conducted flight trials under 5G network in Municipality of Egaleo stadium (part of 5GENESIS 5G Athens platform, Greece), on October 19–20 2020, for collecting inputs and verifying the interaction between 5G and drones under 5G!Drones UC4. Two videos available at 5G!Drones YouTube channel. An overview report on Egaleo Stadium trials is available online.

5G!Drones partners NCSR Demokritos, Cosmote, CAFA Tech, robots.expert and INFOLYSIS, conducted flight trials under 5G network in OTE–Cosmote Academy premises (part of 5GENESIS 5G Athens platform, Greece), on October 21 2020, for testing the offering of a better level of network services with drones under 5G and avoiding dropped calls and degraded Internet connectivity during mass events (UC4). A video is available at the 5G!Drones YouTube channel. An overview report on OTE–Cosmote Academy trials is available online.

5G!Drones partners Eurecom, Cafatech, Airbus, Drone Radar, Frequentis, and robots.experts conducted remote Feasibility tests using Eurecom (France) and CAFA Tech (Estonia) facility on 17th and 18th December, 2020 to test how 5G!Drones containers (C2+U–Space–, Mission Critical Services platform– and latency measurement container) work in Eurecom's servers and the connections with these containers' client applications in smartphones. A video on it is available at 5G!Drones YouTube channel.

The key value from the performed Feasibility Tests in 2020 are as follows:

- for all participants a common understanding of 5G!Drones technical solutions and testing procedures was reached;
- inputs for the Trial controller and Enablers development were provided;
- Insights on container-based Cloud Native solutions use on the 5G Edge server.

UC1-UTM	UC2-PS	UC3-SA	UC4-CON
UAV Traffic Management	Public Safety	Structural Awareness	Connectivity during crowded events
Scenario 1: UTM command and control application	Scenario 1: Monitoring & support	Scenario 1: Infrastructure inspection	Scenario 1: Connectivity, automatic detection of heading
Scenario 2: 3D Real-time monitoring with cameras and software for UTM	Scenario 2: Disaster recovery	Scenario 2: UAV detection and data collection	
Scenario 3: Logistics	Scenario 3: Police	Scenario 3: Location of UE in non-GPS environments	



SUBMITTED DELIVERABLES

D3.2 Report on vertical service-level enablers for 5G!Drones - M26: A report focusing on the design and implementation activities regarding the use case scenarios.

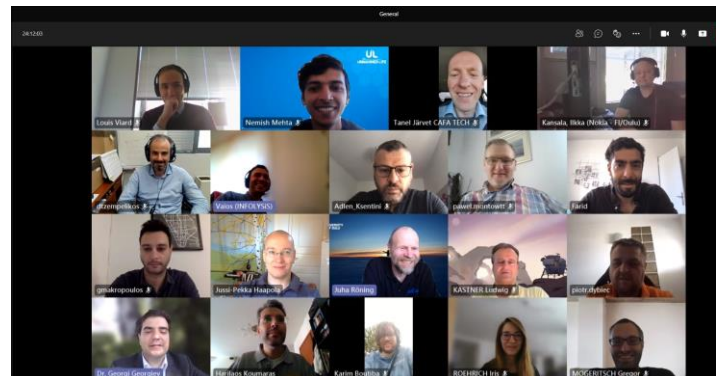
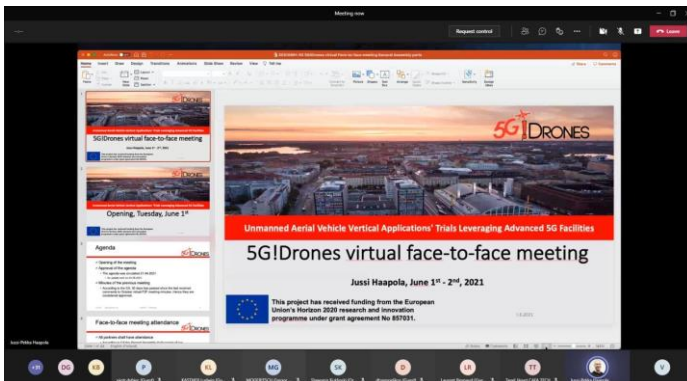
D4.2 Integration status and updated integration - M26: This deliverable provides a status update on the integration procedures and a refined integration plan.

D4.3 Trial plan - M26: This deliverable provides a detailed plan of the trials that will be carried out, including a trial schedule, use case scenarios and KPIs to be tested per trial, 5G facilities and resources to be used, trial participants, etc.

If you wish to learn more on the 5G!Drones deliverables, you may visit the official 5G!Drones website on the corresponding deliverables webpage: <https://5gdrones.eu/deliverables/>

7TH 5G!Drones GENERAL ASSEMBLY (1-2 JUNE 2021)

The 7th 5G!Drones GA plenary meeting was organised remotely due to safety restrictions that apply worldwide! This virtual GA meeting ran for 2 days (1-2 June 2021) discussing the project progress, WPs/tasks activities, the upcoming deliverables, milestones and the new goals to be met over the next period. An extensive discussion was also held about the participation of 5G!Drones project in the 2021 EuCNC & 6G Summit event as well as about the upcoming September review meeting.





5G!DRONES IN EuCNC 2021 & 6G SUMMIT

The 2021 Joint EuCNC & 6G Summit (8-11 June 2021), initiated this year, built on putting together two successful conferences in the area of telecommunications: EuCNC (European Conference on Networks and Communications), in its 30th edition of a series, supported by the European Commission; the 6G Summit, in its 3rd edition, originated from the 6G Flagship program in Finland, one of the very first in its area. 5G!Drones participated in this event through its virtual Booth #4. Partners demonstrated the interoperability between 5G and drones, use cases, pre-trial results and core objectives and next steps of the project. You may learn more here: <https://www.eucnc.eu/exhibitions-and-demos/>

Which stand did you like the most?

☐ 5G EVE

☐ 5G HEART

☐ 5G!Drones

☐ 5G-DIVE

☐ 5G-Drive

☐ 5G-LOGINNOV'S

☐ 5G-MOBIX

Cancel Submit

LIVE NOW WSI - 6G for Connecting the Unconnected in Rural and Remote Areas to ... Chat About

EUCNC | 6G Summit
Virtual Conference (Porto, Portugal) • 8-11 June 2021
On the Road to 6G
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Virtual Conference (Porto, Portugal) • 8-11 June 2021

NOS HUAWEI NOKIA VDI ERICSSON

Which stand did you like the most?

☐ 5G EVE

☐ 5G HEART

☒ 5G!Drones

☐ 5G-DIVE

☐ 5G-Drive

☐ 5G-LOGINNOV'S

☐ 5G-MOBIX

Cancel Submit

5G!Drones

5G!Drones



Communication Channels



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Call: H2020-ICT-2018-2
Topic: ICT-19-2019
Type of action: R&I
Duration: 42 Months
Start date: 1/6/2019